REMARKS

Accompanying this response, please find marked-up paragraphs of the specification which overcome some informalities noted in the specification. The undersigned avers that the enclosed replacement paragraphs of the specification do not contain any new matter.

Please consider new claims 12-22 upon consideration of this application.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,

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[001] PLANETARY GEAR FOR MOUNTING ON AN ELECTROMOTOR

[002] **FIELD OF THE INVENTION**

[003] The invention relates to a planetary gear for mounting on an electromotor~~, according to the pre-characterising portion of the principal claim~~.

[004] **BACKGROUND OF THE INVENTION**

[005] Such planetary gears are used for many purposes in automation technology and plant and machinery in general. With such a planetary gear, in which a sun gear can be driven by an output shaft of the electromotor, an annular gear is positioned in the housing and a planetary carrier forms the output, various transmission ratios, typically in the range 4:1 to 10:1, can be produced by varying the geometry of the sun gear and planetary gear wheels and of the planetary carrier.

[006] Owing to the high power density involved, even small internal power losses can give rise to undesired high temperatures. Because of the compactness of the structure, the heat generated by these losses often cannot be dissipated to the desired extent. High temperatures affect service life adversely. A large part of the power loss is attributable to the seals and bearings of the rapidly rotating sun gear shaft on the input side.

[007] A gear of this type is disclosed for example in DE 198 08 184 C1. To receive an output shaft of the electromotor, the sun gear shaft of this known planetary gear is made hollow in a receiving area of enlarged diameter. The sun gear shaft is sealed with respect to the housing by a radial sealing ring.

[008] **SUMMARY OF THE INVENTION**

[009] The purpose of the present invention is to develop further a planetary gear of the type described so as to minimise the power loss. Furthermore, the planetary gear should be of compact structure and economical to manufacture.

[010] ~~The invention's objectives are achieved by a planetary gear of the said type incorporating also the features of the characterising portion of the principal claim.~~

[011] Thus, in accordance with the invention the sealing element that seals the sun gear shaft on the outside with respect to the housing is arranged axially

~~[015]~~

~~[016] Other advantageous features of the invention are explained~~

[015] BRIEF DESCRIPTION OF THE DRAWING

[016] **The invention will now be described, by way of example,** with reference to the ~~attached drawing,~~**accompanying drawings in** which**:**

[017] **Fig. 1** shows a longitudinal section through a planetary gear according to the invention.

~~[017]~~

[018] **DETAILED DESCRIPTION OF THE INVENTION**

[019] In the single figure attached, the housing is indexed as 2, the sun gear shaft on the input side as 4 and the output shaft of a planetary gear according to the invention as 6. The output shaft 6 rotates with a planetary carrier 8, on which several uniformly distributed planetary gear wheels 10 are mounted and able to rotate. The planetary gear wheels 10 are in simultaneous gear-tooth engagement with a central sun gear 12 that can be driven by the sun gear shaft 4 and with an annular gear 14 fixed in the housing 2.

[020] To receive an output shaft (not shown) of an electromotor, the sun gear shaft 4 has a hollow receiving area 16 that extends axially over the length of a cylindrical bore 18 in the sun gear shaft 4. The inside space of the housing 2 is filled with lubricant and sealed with respect to the outside by two sealing elements formed as radial sealing rings 20, 22. The radial sealing rings are fixed in the housing 2 and are associated with cylindrical functional surfaces 24, 26 of the output shaft and the sun gear shaft respectively. Sliding friction takes place between the radial sealing rings and the said functional surfaces.

[021] According to the invention, the radial sealing ring 22 arranged between the housing 2 and the sun gear shaft 4 is positioned outside the receiving area 16 for the output shaft of the electromotor in an axial section of the sun gear shaft whose outer diameter is smaller compared with that of the receiving area. Only very small frictional losses occur on the functional surface 26, whose diameter is smaller than the diameter of the bore 18, so that higher efficiency is attained and problems due

to high temperatures are avoided. Between the receiving area 16 and the location of the radial sealing ring 22 the sun gear shaft has a diameter step 23.

[022] The inner ring of the bearing 28 for the sun gear shaft 4 is also arranged outside the receiving area 16 for the output shaft of the electromotor in an area with reduced outer diameter, so that a bearing of smaller size can be used.

[023] The diameter of the bearing holder on the sun gear shaft is also smaller than the diameter of the bore 18.

[024] The outer bearing ring of the bearing 28 is located in the planetary carrier 8, radially inside the inner ring of a planetary carrier bearing 30. The bearing 28 is positioned axially within the structural space occupied by the planetary carrier bearing 30, and this makes it possible for the axial length of the planetary gear to be short. For the planetary carrier 8 a second bearing 32 is provided which, like the bearing 30, is in the form of a conical-roller bearing and which forms an X arrangement together with the latter.

[025] In the axial space between the conical-roller bearings 30, 32 the planetary carrier 8 has on the two sides of each planetary gear wheel 10 bores 34, 36 that extend through the carrier. These bores 34, 36 each accommodate a planetary bearing pin 38, on which the planetary gear wheel 10 is mounted by means of cylindrical rollers 40 and can rotate. The end surface of the planetary bearing pin ~~40~~**38** abuts against the inner ring of the planetary carrier bearing 32, 34, so that it is advantageously secured against axial displacement without further measures. On each side of each planetary gear wheel 10 thrust washers in the form of annular discs are arranged on the planetary bearing pin 38, and these restrict the axial movement of the planetary gear 10.

[026] The bearing 28 for the sun gear shaft 4 is secured in the planetary carrier 8 against axial displacement in one direction by a circlip 46. To fit the bearing 28, the circlip 46 can be pressed completely into an annular groove 48 in the planetary carrier, which is axially adjacent to the functional surface 47 that receives the outer ring of the bearing. As soon as the outer ring of the bearing 28 has been pushed past the area of the annular groove 48 during assembly, the circlip 46 snaps together and so secures the outer ring of the bearing against axial displacement.

a1

[002] FIELD OF THE INVENTION

[003] The invention relates to a planetary gear for mounting on an electromotor.

a2

[004] BACKGROUND OF THE INVENTION

a3

[008] SUMMARY OF THE INVENTION

a4

[015] BRIEF DESCRIPTION OF THE DRAWING

[016] The invention will now be described, by way of example, with reference to the accompanying drawings in which:

[017] Fig. 1 shows a longitudinal section through a planetary gear according to the invention.

[018] DETAILED DESCRIPTION OF THE INVENTION